Air Force Research Laboratory | AFRL

Science and Technology for Tomorrow's Air and Space Force

Materials and Manufacturing Directorate

2977 P Street • Wright-Patterson Air Force Base, Ohio • 45433-7746

Mission: Perform comprehensive research and development activities to provide the Air Force with new or improved materials, processes, and manufacturing technologies.

Operations: Scientists and engineers in the Directorate explore new materials, processes and manufacturing technologies for use in aerospace applications including aircraft, spacecraft, missiles, rockets, and ground-based systems and their structural, electronic and optical components. Areas of expertise include thermal protection materials, metallic and nonmetallic structural materials, nondestructive inspection, materials used in aerospace propulsion systems, electromagnetic and electronic materials, and laser hardened materials. With a host of modern materials analysis laboratories, the Directorate also provides support to Air Force weapon system acquisition offices and maintenance depots to solve materials related concerns and problems. The Directorate plans, executes and integrates advanced manufacturing technology programs and affordability initiatives addressing manufacturing process technologies, computer integrated manufacturing and excellence through design for producibility, quality, costs and the use of commercial processes and practices for military needs. Through its Airbase Technologies Division, located at Tyndall AFB, Florida, the Directorate conducts programs that enhance readiness, deployment, fire protection, peacetime training, and crash and rescue operations. The Directorate also manages the Air Force Corrosion Control Program Office at Robins AFB, Georgia; the Air Force Nondestructive Inspection Office at Tinker AFB, Oklahoma and the Air Force Advanced Composites Office at Hill AFB, Utah.

Top Leaders: Dr. Charles Browning, Director; Mr. Gary Waggoner, Associate Director for Manufacturing Technology and Affordability; Col. Tim Brotherton, Deputy Director; Dr. Barry Farmer, Chief Scientist; Mr. Bob Rapson, Chief, Nonmetallic Materials Division; Dr. Walt Griffith, Chief, Metals, Ceramics and NDE Division; Mr. John Mistretta, acting Chief, Manufacturing Technology Division; Mr. George Schmitt, Chief, Integration and Operations Division; Dr. Katherine A. Stevens, Chief, Survivability and Sensor Materials Division; Col. Donald Huckle, Chief, Airbase Technologies Division; Mr. Roger Griswold, Chief, Systems Support Division

Personnel: 497 government, including 423 civilians (111 Ph.D.); 64 officers (4 Ph.D.) and 10 enlisted; 585 on-site contractors (107 Ph.D.)

History: The Directorate was officially activated in December 1917 as the Materials Section of the U.S. Army Signal Corps at McCook Field in Dayton, Ohio. From those early years of plywood and cloth to advanced lightweight composite materials for spacecraft, Directorate scientists and engineers have helped advance the technologies of flight. While today the Directorate hosts a comprehensive in-house research program, especially in basic research, it also originates and manages contractual and cooperative agreement research efforts with industry and academic institutions. In Ohio alone the past five years, the Directorate managed 148 separate contract efforts totaling almost $400 million with 57 different Ohio companies. These efforts helped produce some of the most state-of-the-art military aerospace materials technologies available anywhere in the world, while at the same time providing a tremendous positive impact to the Ohio economy. But military and economic impacts are only

a portion of benefits realized. Spinoffs from Directorate developed or sponsored technologies have also helped improve the quality and durability of many consumer products. Involvement in the development of lightweight structural composite materials has had a major impact, not only on military aviation but also on civil aviation, the automotive industry, recreational equipment and many other consumer goods. Work in transferring advanced aerospace composite technologies to repair and build highway bridges could revolutionize the construction industry and save billions in infrastructure costs. Working with Ohio's Butler County Engineer's Office, the Directorate provided the technical expertise to build and install the first all-composite vehicle bridge in the country. While the Directorate's complete legacy of achievements is too lengthy to mention here, a few other technical accomplishments include:

- Advanced composites for lighter, stronger and higher temperature structural components
- Rare-earth magnets that helped miniaturize electronic motors
- Fire-resistant hydraulic fluids
- Improved semiconductor and superconductor materials for electronics and sensors
- Eye protection for flight crews operating in laser threat environments
- High temperature intermetallic alloys for improved aircraft turbine engines
- Mobile nondestructive inspection systems for field evaluations of aircraft structural integrity
- Failure analysis methods and handbooks for evaluating material failures

In 1997, a major reorganization of the Air Force's science and technology program combined the former Wright Laboratory Manufacturing Technology Directorate at Wright-Patterson AFB, the former Armstrong Laboratory Environics Directorate, and the former Airbase Structures Branch of Wright Laboratory's Flight Dynamics Directorate at Tyndall AFB, FL, with the Materials Directorate to form the Directorate as it is today. This reorganization strengthened an already world-class research and development workforce with scientists and engineers who have already made major strides in the development of new manufacturing technologies that make Air Force systems more affordable and maintainable; improved environmental management systems and procedures that have reduced and, in some cases, totally eliminated hazardous waste products from Air Force operations and increased the durability and survivability of air base infrastructures.

What's Next: The Materials and Manufacturing Directorate will continue to seek enabling technologies that will help turn today's futuristic materials into tomorrow's reality through:

- Increased investments in space-based technologies
- Developing new materials and manufacturing techniques to reduce aircraft acquisition costs
- Research in microelectronic machines
- Research in the manipulation of atoms to tailor materials for specific needs (nanotechnology)
- Advanced laser protection materials for personnel and sensors

ML Mission/Vision

Plan and execute the USAF program for materials and manufacturing in the areas of basic research, exploratory development, advanced development and industrial preparedness. Provide responsive support to Air Force product centers, logistics centers and operating commands to solve system and deployment related problems and to transfer expertise.

Aerospace materials and manufacturing leadership for the Air Force and the nation

For more information on the Materials and Manufacturing Directorate visit www.afrl.af.mil, call (937)255-6469 or send an email with your question to techinfo@wpafb.af.mil